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**west virginia** department of environmental protection

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Office of Oil and Gas  
601 57th Street SE  
Charleston, WV 25304  
(304) 926-0450  
(304) 926-0452 fax

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

October 28, 2014

**WELL WORK PERMIT**

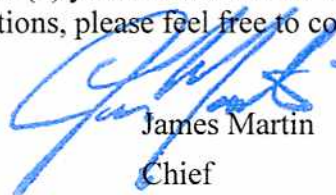
**Horizontal 6A Well**

This permit, API Well Number: 47-1706569, issued to ANTERO RESOURCES CORPORATION, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.



James Martin  
Chief

Operator's Well No: MILO UNIT 2H  
Farm Name: HILL, PHILLIP N. ET AL  
**API Well Number: 47-1706569**  
**Permit Type: Horizontal 6A Well**  
Date Issued: 10/28/2014

**Promoting a healthy environment.**

## PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

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### CONDITIONS

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1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.
2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.
6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.
9. Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to [DEPOOGNotify@wv.gov](mailto:DEPOOGNotify@wv.gov) within 30 days of commencement of drilling.

WW-6B  
(9/13)

STATE OF WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
WELL WORK PERMIT APPLICATION

1) Well Operator: <u>Antero Resources Corporation</u>	494488557	017 - Doddridge	3 Grant	611 Smithburg 7.5'
	Operator ID	County	District	Quadrangle

2) Operator's Well Number: Milo Unit 2H Well Pad Name: Lemley

3) Farm Name/Surface Owner: Phillip N. Hill, et al Public Road Access: CR 30 +

4) Elevation, current ground: ~1,320' Elevation, proposed post-construction: 1,301'

5) Well Type (a) Gas ☒ Oil ☐ Underground Storage ☐  
Other ☐

(b) If Gas Shallow ☒ Deep ☐  
Horizontal ☒

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):  
Marcellus Shale: 7,400' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2,950#

8) Proposed Total Vertical Depth: 7,400'

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 11,800'

11) Proposed Horizontal Leg Length: 2,477'

12) Approximate Fresh Water Strata Depths: 291', 345', 366'

13) Method to Determine Fresh Water Depths: Offset well records. Depths have been adjusted according to surface elevations.

14) Approximate Saltwater Depths: 1460', 1673', 1700', 1710'

15) Approximate Coal Seam Depths: 980'

16) Approximate Depth to Possible Void (coal mine, karst, other): None Anticipated

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes ☐ No ☒

(a) If Yes, provide Mine Info: Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

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(9/13)

18)

CASING AND TUBING PROGRAM

TYPE	Size	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu. Ft.)
Conductor	20"	New	H-40	94#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	420'	420'	CTS, 583 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2,565'	2,565'	CTS, 1,044 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	11,800'	11,800'	2,812 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7,200'	
Liners							

DCW  
8-11-2014

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	24"	0.438"	1530	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	Class A	1.18
Intermediate						
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12630	Lead-H/POZ & Tail - H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11200		
Liners						

PACKERS

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

Received

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(9/13)

**19) Describe proposed well work, including the drilling and plugging back of any pilot hole:**

Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale.

**20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:**

Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well."

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 4.31 Acres\* (See note below)

22) Area to be disturbed for well pad only, less access road (acres): 4.31 acres

**23) Describe centralizer placement for each casing string:**

Conductor: no centralizers

Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole to surface.

Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface.

Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing.

**24) Describe all cement additives associated with each cement type:**

Conductor: no additives, Class A cement.

Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake

Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat

Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% C-51

Production: Tail cement- Class H + 45 PPS Calcium Carbonate + 1.0% FL-160 + 0.2% ACGB-47 + 0.05% ACSA-51 + 0.2% ACR-20

**25) Proposed borehole conditioning procedures:**

Conductor: blowhole clean with air, run casing, 10 bbls fresh water.

Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer.

Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water.

Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to base of curve, pump high viscosity sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

\*Please note that this location is sharing the Access Roads (10.4 acres), Truck Turnaround Pad (1.36 acres), and Excess/Topsoil Material Stockpiles (5.65 acres) with the Revival pad and Lemley Centralized Freshwater Impoundment sites. Reference "Site Plan/Construction Staging Note" on page 1 of the Lemley Well Pad design. The Lemley pad will consist of 4.31 total acres of disturbance which is referenced as a "Staging Area" on the Lemley Centralized Freshwater Impoundment design.

4701706569

API Number 47 - 017 - \_\_\_\_\_  
Operator's Well No. Milo Unit 2H

**STATE OF WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
OFFICE OF OIL AND GAS**

## FLUIDS/ CUTTINGS DISPOSAL &amp; RECLAMATION PLAN

Operator Name	Antero Resources Corporation	OP Code	494488557
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Watershed (HUC 10) Howell Run                      Quadrangle Smithburg 7.5'

Elevation 1,301' County Doddridge District Grant

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes ☒ No ☐

Will a pit be used? Yes ☐ No ☒

If so, please describe anticipated pit waste: No pit will be used at this site. Drilling and flowback fluids will be stored in tanks. Cuttings will be tanked and hauled off site.

Will a synthetic liner be used in the pit? Yes ☐ No ☒ If so, what ml.? N/A

**Proposed Disposal Method For Treated Pit Wastes:**

Land Application \_\_\_\_\_  
 Underground Injection ( UIC Permit Number \_\_\_\_\_ )  
☒ Reuse (at API Number \_\_\_\_\_ Future permitted well locations when applicable. API# will be provided on Form WR-34 )  
☒ Off Site Disposal (Supply form WW-9 for disposal location) (Meadowfill Landfill Permit #SWF-1032-98)  
 Other (Explain \_\_\_\_\_)

Will closed loop system be used? If so, describe: Yes

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Surface - Air/Freshwater, Intermediate - Dust/Stiff foam, Production - Water Based Mud

-If oil based, what type? Synthetic, petroleum, etc. N/A

Additives to be used in drilling medium? Please See Attachment

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Stored in tanks, removed offsite and taken to landfill.

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

-Landfill or offsite name/permit number? Meadowfill Landfill (Permit #SWF-1032-98)

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature 

Company Official (Typed Name) Kevin Klstrom

Company Official Title Vice President of Drilling and Production

MEGAN DARLING  
NOTARY PUBLIC  
STATE OF COLORADO  
NOTARY ID 20144028112  
MY COMMISSION EXPIRES JULY 17, 2018

Subscribed and sworn before me this 1st day of August, 20 14

Notary Public

My commission expires July 17<sup>th</sup> 2018

4701706569

Form WW-9

Operator's Well No. Milo Unit 2H

Antero Resources Corporation

Proposed Revegetation Treatment: Acres Disturbed 4.31\* (See note below) Prevegetation pH \_\_\_\_\_Lime 2-4 Tons/acre or to correct to pH 6.5Fertilizer type Hay or straw or Wood Fiber (will be used where needed)Fertilizer amount 500 lbs/acreMulch 2-3 Tons/acre

\*Please note that this location is sharing the Access Roads (10.4 acres), Truck Turnaround Pad (1.36 acres), and Excess/Topsoil Material Stockpiles (5.65 acres) with the Revival pad and Lemley Centralized Freshwater Impoundment sites. Reference "Site Plan/Construction Staging Note" on page 1 of the Lemley Well Pad design. The Lemley pad will consist of 4.31 total acres of disturbance which is referenced as a "Staging Area" on the Lemley Centralized Freshwater Impoundment design.

Seed Mixtures

## Temporary

## Permanent

Seed Type      lbs/acre  
Annual Rye Grass      40

Seed Type      lbs/acre  
Crownvetch      10-15

\*See Attached Table 3 for additional seed type (Lemley Pad Design Page 18)

\*See attached table 4a for additional seed type (Lemley Pad Design Page 18)

\*or type of grass seed requested by surface owner

\*or type of grass seed requested by surface owner

NOTE: No Fescue or Timothy Grass shall be used.

Attach:

Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: Douglas NewlonComments: Presseed + Mulch install K+S to WV Dep regulations

Received

AUG 21 2014

Title: Oil & Gas InspectorDate: 8-11-2014Office of Oil and Gas  
WV Dept. of Environmental ProtectionField Reviewed? ( ☒ ) Yes ( ☐ ) No



# Well Site Safety Plan

## Antero Resources

**Well Name:** Phebe Unit 2H, Phebe Unit 1H, Abram Unit 2H, Abram Unit 1H, Trainer Unit 2H, Trainer Unit 1H, Rollins Unit 2H, Peter Unit 2H, Peter Unit 1H, Milo Unit 2H

Received

**Pad Location:** Lemley Pad  
Doddridge County/ Grant District

AUG 21 2014

Office of Oil and Gas  
WV Dept. of Environmental Protection

**GPS Coordinates:** Lat 39° 19'34.87"/Long 80° 40'48.40" (NAD83)

### Driving Directions:

From US 50 near Clarksburg, head west on US 50 for 16 miles. Turn right onto County Route 9/Tarkiln Run. Take an almost immediate left toward County Route 3/Big Flint Rd., and continue for 0.2 miles. Take the first right onto County Route 3/Big Flint Rd. and continue for 5 miles, then the access road will be on the left.

**EMERGENCY (24 HOUR) CONTACT 1-800-878-1373**

DCW  
8-11-2014



***Form WW-9 Additives Attachment*****SURFACE INTERVAL**

1. Fresh Water
2. Soap –Foamer AC
3. Air

**INTERMEDIATE INTERVAL*****STIFF FOAM RECIPE:***

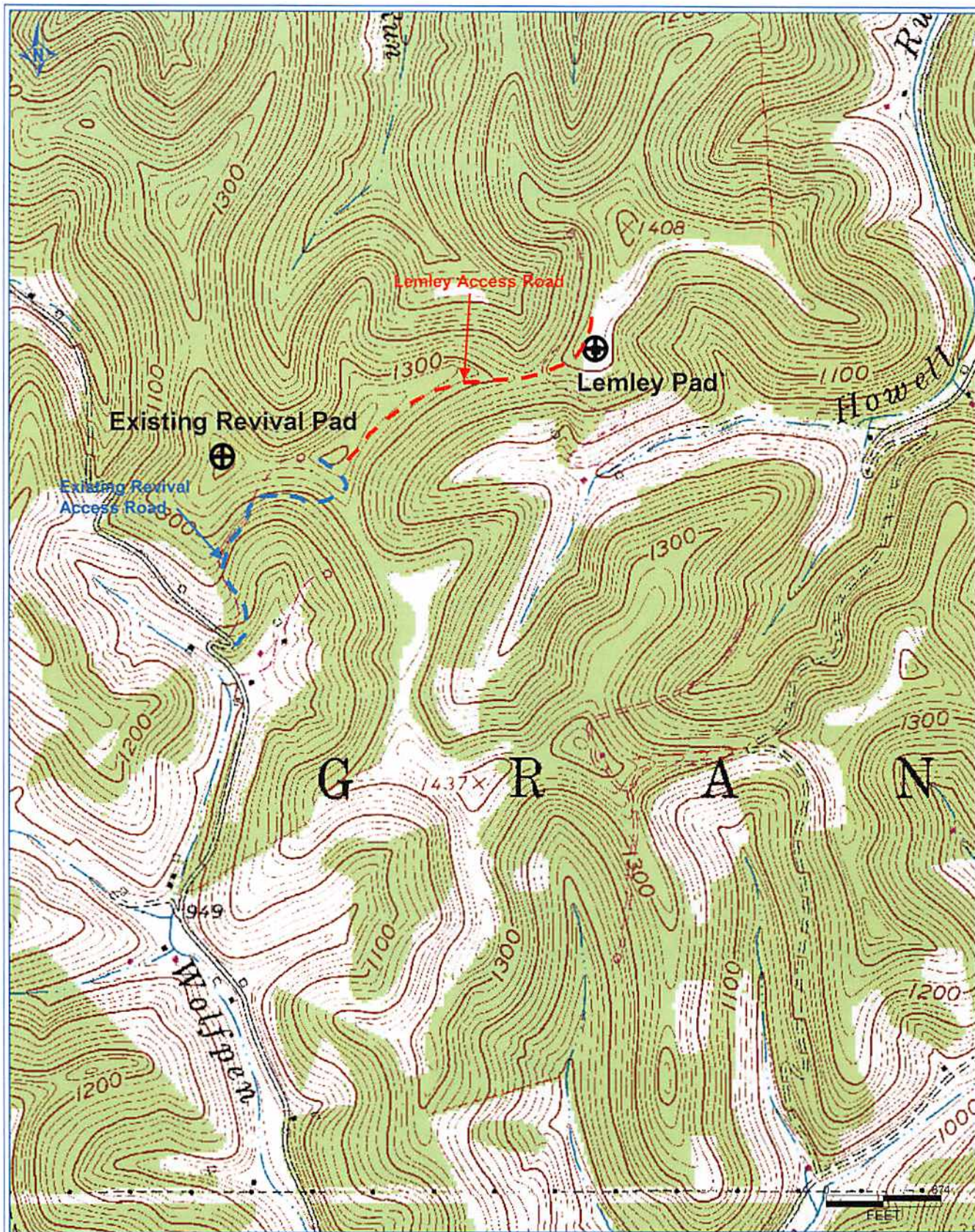
- 1) 1 ppb Soda Ash / Sodium Carbonate-Alkalinity Control Agent
- 2) 1 ppb Conqor 404 ( 11.76 ppg) / Corrosion Inhibitor
- 3) 4 ppb KLA-Gard ( 9.17 ppg) / Amine Acid Complex-Shale Stabilizer
- 4) 1ppb Mil Pac R / Sodium Carboxymethylcellulose-Filtration Control Agent
- 5) 12 ppb KCL / Potassium Chloride-inorganic Salt
- 6) Fresh Water 80 bbls
- 7) Air

**PRODUCTION INTERVAL**

1. Alpha 1655  
Salt Inhibitor
2. Mil-Carb  
Calcium Carbonate
3. Cottonseed Hulls  
Cellulose-Cottonseed Pellets – LCM
4. Mil-Seal  
Vegetable, Cotton & Cellulose-Based Fiber Blend – LCM
5. Clay-Trol  
Amine Acid Complex – Shale Stabilizer
6. Xan-Plex  
Viscosifier For Water Based Muds
7. Mil-Pac (All Grades)  
Sodium Carboxymethylcellulose – Filtration Control Agent
8. New Drill  
Anionic Polyacrylamide Copolymer Emulsion – Shale Stabilizer
9. Caustic Soda  
Sodium Hydroxide – Alkalinity Control
10. Mil-Lime  
Calcium Hydroxide – Lime
11. LD-9  
Polyether Polyol – Drilling Fluid Defoamer
12. Mil Mica  
Hydro-Biotite Mica – LCM

13. Escaid 110  
Drilling Fluid Solvent – Aliphatic Hydrocarbon
14. Ligco  
Highly Oxidized Leonardite – Filtration Control Agent
15. Super Sweep  
Polypropylene – Hole Cleaning Agent
16. Sulfatrol K  
Drilling Fluid Additive – Sulfonated Asphalt Residuum
17. Sodium Chloride, Anhydrous  
Inorganic Salt
18. D-D  
Drilling Detergent – Surfactant
19. Terra-Rate  
Organic Surfactant Blend
20. W.O. Defoam  
Alcohol-Based Defoamer
21. Perma-Lose HT  
Fluid Loss Reducer For Water-Based Muds
22. Xan-Plex D  
Polysaccharide Polymer – Drilling Fluid Viscosifier
23. Walnut Shells  
Ground Cellulosic Material – Ground Walnut Shells – LCM
24. Mil-Graphite  
Natural Graphite – LCM
25. Mil Bar  
Barite – Weighting Agent
26. X-Cide 102  
Biocide
27. Soda Ash  
Sodium Carbonate – Alkalinity Control Agent
28. Clay Trol  
Amine Acid complex – Shale Stabilizer
29. Sulfatrol  
Sulfonated Asphalt – Shale Control Additive
30. Xanvis  
Viscosifier For Water-Based Muds
31. Milstarch  
Starch – Fluid Loss Reducer For Water Based Muds
32. Mil-Lube  
Drilling Fluid Lubricant





## Antero Resources Corporation

Appalachian Basin

Milo Unit 2H

Doddridge County

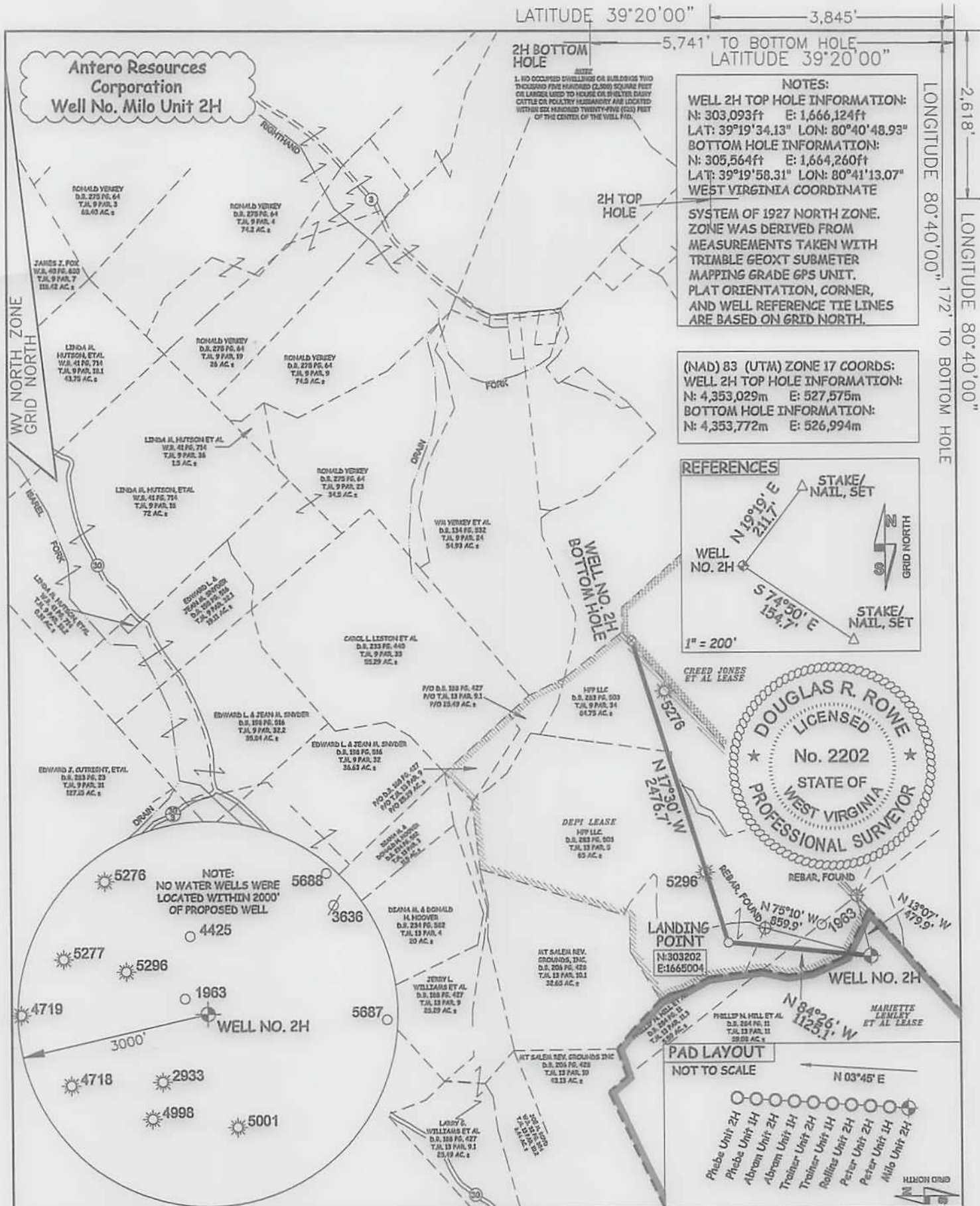
Quadrangle: Smithburg

Watershed: Howell Run

District: Grant

Date: 8-04-2014





JOB # 12-133WA  
DRAWING # MILO2H  
SCALE 1" = 1000'  
MINIMUM DEGREE OF  
ACCURACY SUBMETER  
PROVEN SOURCE OF ELEV.  
SUBMETER MAPPING GRADE GPS

I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT  
TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE  
INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND  
PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



STATE OF WEST VIRGINIA, DIVISION  
OF ENVIRONMENTAL PROTECTION,  
OFFICE OF OIL AND GAS

WILLOW LAND SURVEYING PLLC  
220 MASONIC AVE. PENNSBORO  
WEST VIRGINIA 26415

#### LEGEND

- Surface Owner Boundary Lines +/-
- Interior Surface Tracts +/-
- Existing Fence
- Found monument, as noted

DOUGLAS R. ROWE P.S. 2202

DATE 07/30/14

OPERATOR'S WELL# MILO UNIT 2H

API WELL # 47 - 017 - 06569  
STATE COUNTY PERMIT

STATE OF WEST VIRGINIA  
DEPARTMENT OF ENERGY  
DIVISION OF OIL AND GAS

WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL  
(IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X  
LOCATION: ELEVATION 1,301' WATERSHED HOWELL RUN  
QUADRANGLE SMITHBURG 7.5' DISTRICT GRANT COUNTY DODDRIDGE

SURFACE OWNER PHILLIP N. HILL ET AL ACREAGE 59.08 ACRES +/-  
OIL & GAS ROYALTY OWNER MARIETTE LEMLEY ET AL; DEPI; CREED JONES ET AL LEASE ACREAGE 66.87 ACRES +/-; 137 ACRES +/-; 72 ACRES +/-

PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X  
PLUG OFF OLD FORMATION PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL  
(SPECIFY) PLUG & ABANDON CLEAN OUT & REPLUG  
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,400' TVD 11,800' MD

WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER  
ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD  
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313

COUNTY NAME PERMIT